The subject of M. Leitch's case was a man aged 40 years, who died in consequence of a fracture of the femur. The following were the peculiarities revealed on *post-mortem* examination:

The general appearance of the body resembled that of a female. The skin was soft, the limbs slender, and the shoulders narrow. There was no trace of penis or scrotum, and the umbilicus appeared also to be absent.

Above the pubes there was a small orifice, around which slight excoriations were observed, produced by the flow of urine; a projection near this opening appeared to be the umbilical cicatrix.

On each side of the pubes there was a small eminence covered with a perfectly smooth skin, containing the testicles; the horizontal branches of the pubic bones were absent,—their place was supplied by cartilage; the pyramidal muscles were also wanting. Not the least trace of a bladder could be found. The ureters extended to the orifice just noticed, which was, in fact, formed by their junction. Nothing could be discovered which resembled even a portion of the bladder. The right ureter, however, was enormously enlarged; from the pelvis of the kidney to its external termination being the size of the small intestine. Near its orifice it contracted to the diameter of a goose quill, and at this place some muscular fibres could readily be distinguished. This distended ureter had doubtless, to a certain extent, fulfilled the office of the bladder, and the muscular fibres at its orifice acted as a sphincter. The left ureter was in a natural state. The testicles were small, but healthy; the vesiculæ seminales existed, although imperfectly developed; the prostate gland, which was very small, was situated behind the point of union of the ureters; the vasa differentia terminated in two or three small orifices near the external opening.

This man had managed to conceal his deformity. He had sexual desires, and had several times been on the point of marrying.

ORGANIC CHEMISTRY.

10. *Researches on the composition of Blood in health and in disease.*—The Nos. of the *Gazette Médicale de Paris*, for Nov. 23 and 30, and Dec. 7, 14 and 21, 1844, contain an extremely interesting memoir on this subject presented to the French Academy of Medicine in November last, by MM. Becquerel and Rodier, of which we shall give a brief analysis.

I.—*Blood in Health.*

After a preliminary account of their mode of analysis, MM. B. and R. give the following tables exhibiting the composition of healthy blood.

1. *Natural composition of the blood in man.*

The following table exhibits the mean composition, and also the maximum and minimum of the blood in 11 cases.

Composition of 1000 *grammes of blood of man in health.*

	Mean.	Max.	Min.
Density of the defibrinated blood -	1060.2	1062	1058
Do. of the serum - - -	1028	1030	1027
Water - - - - - -	779	800	760
Globules - - - - -	141.1	152	131
Albumen - - - - -	69.4	73	62
Fibrin - - - - - -	2.2	3.5	1.5
Extractive matters and free salts -	6.8	8.0	5
Fatty matters - - - - -	1.600	3.255	1.000
Seroline - - - - -	0.020	0.080	—
Fatty phosphorated matter - -	0.488	1.000	0.270
Cholesterine - - - - -	0.088	0.175	0.030
Soapy matter - - - - -	1.004	2.100	0.700

1000 *grammes of calcined blood.*

	Mean.	Max.	Min.
Chloride of sodium - - - -	3.1	4.2	2.3
Soluble salts - - - -	2.5	3.2	2.0
Phosphates - - - - -	0.334	0.7	0.225
Iron - - - - - -	0.565	0.633	0.508

From those numbers the following important conclusions may be deduced:—

1. The limits within which the composition of healthy blood varies, are small, and probably depend on age, constitution, and diet.

2. The number for the globules exceeds 127, which has hitherto been generally admitted to express their physiological mean. This depends on a distinction not having been made between male and female blood, and probably also on this, that the blood analyzed to determine that mean was not taken from persons really in health.

3. The number for the fibrin 2.2 is below the number 3, which is that generally admitted. MM. B. and R. are, too, satisfied of their accuracy to admit that the error lies with them.

As to the influence of *age*, MM. B. and R. have no analysis below the age of 20. From 20 to 30, the mean they obtained were accurately conformable to the general mean. From 30 to 40, the composition of the blood in every instance corresponded to the general mean very nearly; the only principle which was constantly augmented was cholesterine, and it was nearly doubled. From 50 to 66, there was little difference, save a diminution in the quantity of fibrin, the mean quantity of which was represented by 2. The influence of *constitution* and of diet could not be appreciated, save that the authors of the memoir consider that the quantity of cholesterine increases as the diet is improved.

2. *Composition of the blood in the healthy female.*

The following table exhibits the result of the analysis of the blood of eight women. Their ages were from 22 to 58.

Composition of 1000 *grammes of blood of the healthy female.*

	Mean.	Max.	Min.
Density of the defibrinated blood -	1057.5	1060	1054
Do. of serum - - - - -	1027.4	1030	1026
Water - - - - -	791.1	813	773
Globules - - - - -	127.2	137.5	113
Albumen - - - - -	70.5	75.5	65
Fibrin - - - - - -	2.2	2.5	1.8
Extractive matters and free salts -	7.4	8.5	6.2
Fatty matters - - - - -	1.620	2.860	1
Seroline - - - - -	0.020	0.060	—
Fatty phosphorated matter - -	0.464	0.800	0.250
Cholesterine - - - - -	0.090	0.200	0.025
Soapy matter - - - - -	0.046	1.800	0.725

1000 *grammes of calcined blood.*

	Mean.	Max.	Min.
Chloride of sodium - - -	3.9	4.0	3.5
Soluble salts - - - - -	2.9	3.0	2.5
Phosphates - - - - -	0.354	0.650	0.250
Iron - - - - - -	0.541	0.575	0.486

A comparison of these figures, with those furnished by the analysis of healthy blood, lead to some important conclusions. First, the numbers obtained in these eight analyses do not agree so closely as do those obtained in the analyses of male blood, the limits between the *maxima* and *minima* being greater. It is difficult to account for this, but the same difference will be found to exist in the female in disease. The mean density of defibrinated blood is less than in the male, consequently female blood contains less solid contents, and more water. The mean density of the serum is the same as in man. The proportion of globules is less in the female than in man, and in this diminution of globules consists the fundamental difference between the two kinds of blood. The mean of the globules is 127; the maximum 137; the minimum 113. In man, we have 141 for the mean, 151 for maximum, and 131 for the minimum.

The proportion of fibrin is almost the same in woman as in man; the quantity of albumen is the same in the two sexes; the seroline is alike irregular in both; the fatty phosphorated matter (cerebrine) is also almost in equal quantity in each; the chloride of sodium and the various soluble salts are in almost the same proportion in both sexes, and the iron is in each proportional to the weight of the globules. Menstruation exerts a powerful influence on the natural composition of the blood, and chiefly affects the globules. From a careful analysis of the facts in our possession, we conclude that before menstruation commences the quantity of globules is below 127; if menstruation is imperfectly established, if it is incomplete and irregular, the figure remains below the mean; the moment the function is well established it ascends and fluctuates between 127 and 137; after the critical period of life, when menstruation ceases, the number falls again, in one case to 113, in another to 121.

3. *Of the blood during pregnancy.*

Pregnancy exerts a marked influence on the composition of the blood, causing a diminution of globules and of the albumen; a slight augmentation of the fibrin and of the phosphorated fatty matter and an increase of the water.

The following table exhibits the results of the analysis of nine pregnant women.

Composition of the blood in pregnancy.

	Mean.	Max.	Min.
Density of the defibrinated blood	1051.5	1055.1	1046.2
Do. of the serum,	1025.5	1026.8	1023.6
Water	801.6	—	—
Globules	111.8	127.1	87.7
Albumen	66.1	68.8	62.4
Fibrin	3.5	4	2.5
Extractive matters and free salts	6.6	8.7	4.7
Fatty matters	1.922	2.519	1.158
Seroline	Varia.	0.108	0.018
Fatty phosphorated matter	0.646	0.863	0.381
Cholesterine	0.061	0.225	0.030
Soapy matter	1.195	1.323	0.737

1000 *grammes of calcined blood.*

	Mean.	Max.	Min.
Chloride of sodium	3.2	3.9	2.3
Soluble salts	2.4	2.8	1.8
Phosphates	0.425	0.690	0.282
Iron	0.449	0.490	0.370

The following conclusions may be deduced from this table:—In pregnancy, when not far advanced, and when it has not yet exerted any sensible influence on the constitution, the blood may not be obviously altered, but it becomes sensibly modified as pregnancy advances. The other conclusions that may be deduced have been already stated by anticipation. Although all the pregnant women whose blood was analyzed, had it impoverished, they were nevertheless all plethoric; all complained of headache, vertigo, tinnitus aurium, some of them were somnolent, and generally depressed, and they were all decidedly relieved by venesection.

II.—*Blood in Disease.*

The causes that modify the state of the blood, in the opinion of the authors of the memoir, are eight in number, and may be expressed as general laws as follows. It may be premised that MM. Becquerel and Rodier consider that the modifications of the blood that occur in disease are the consequences and not the cause of the disease; excepting two important cases in which the modifications of the blood are the source of the malady—namely, most diseases caused by marsh miasmata and certain fevers, such as typhoid and yellow fever and the plague.

FIRST LAW.—*The mere fact of the development of a disease almost always decidedly modifies the composition of the blood; this modification is almost always the same in most cases.*

When an acute disease is entirely local, the composition of the blood is not affected. But if it produces constitutional disturbance either primarily or secondarily, then the blood becomes modified from the mere fact of the individual being unwell. They have deduced the fundamental modification produced in the blood from 120 analyses of the blood first abstracted from persons labouring under well determined diseases—bronchitis, pneumonia, pleurisy, acute rheumatism, typhoid fever, tubercular phthisis, &c. The results obtained in man and woman are stated separately, because of the great difference in the composition of the blood in the two sexes. The two following tables represent pretty accurately the mean modifications in the blood from the mere fact of an individual being affected with disease. The quantity of fibrin is not stated in the table, as the modifications of that principle are subject to other and much more complicated influences which must be hereafter considered:—

Mean composition of the blood in acute diseases.

	Man.	Woman.
Density of defibrinated blood	1056	1055
Do. of serum	1027	1026
Water	800	804
Globules	125	118
Albumen	66	65
Extractive matter and free salts	7	7.5
Fatty matter	1.700	1.700
Seroline	Variable.	Variable.
Phosphorated matter	0.560	0.600
Cholesterine	0.110	0.130
Soapy matter	1	0.900
1000 grammes of calcined blood.		
Chloride of sodium	3.1	3.0
Soluble salts	2.6	2.5
Phosphates	0.450	0.450
Iron	0.500	0.490

From a comparison of those two tables we may conclude—that the development of disease causes a diminution of the density of defibrinated blood—diminution of the density of the serum—very marked diminution of the globules—sensible but less decided diminution of the albumen, (and which do not appear in the table, because of the numerous phlegmasiæ among the 120 cases)—slight increase of the sum of the fatty matters—obvious increase of the insoluble phosphates—no change in the proportion of extractive matters, animal soap, soluble salts, or iron, which is always proportional to the globules. The means set forth in the tables are not constant but fluctuate. 1. When the disease is slight, or does not react on the entire system, or when the blood is abstracted very early in the disease, in which cases the blood may be but slightly altered—a proof that the alteration in the composition of the blood is a consequence, not a cause, of disease. 2. On the other hand, when the malady is intense, or the blood drawn at an advanced stage of its progress, the alterations are more decided.

SECOND LAW.—*Bleeding exerts a remarkable influence on the composition of the blood, the greater the oftener the bleeding is repeated.*

MM. ANDRAL and GAVARET established that the chief effect of loss of blood is to diminish the proportion of the globules. The researches of MM. B. and R. confirm this statement. The three following tables show the results of the first, second, and third venesections performed on a certain number of M. Cruveilhier's patients. Ten patients were bled twice, and 10 thrice, which gives 20 first and second, and 10 third bleedings:

Mean composition of the blood in 20 patients bled twice.

	1st venesection.	2d venesection.
Density of defibrinated blood	1055	1051.2
Do of serum	1026.1	1025.3
Water	796.2	812
Globules	125.4	112
Albumen	62.2	62.5
Fibrin	3.7	3.8
Extractive matter and free salts	6.8	7.6
Fatty matter	1.657	1.560
Seroline	0.027	0.047
Phosphorated matter	0.490	0.465
Cholesterine	0.178	0.150
Soapy matter	0.962	0.900
1000 *parts of calcined blood.*		
Chloride of sodium	2.8	3.4
Soluble salts	2.7	2.5
Phosphates	0.435	0.417
Iron	0.527	0.488

Mean composition of the blood in 10 patients bled three times.

	1st venesection.	2d venesection.	3d venesection.
Density of defibrinated blood	1056	1053	1049.6
Do. of serum	1025.8	1026.3	1025.6
Water	793.2	807.7	823.1
Globules	129.2	116.3	99.2
Albumen	65	63.7	64.6
Fibrin	3.5	3.8	3.4
Extractive matter and free salts	7.7	6.9	8
Fatty matter	1.662	1.584	1.530
Seroline	0.026	0.088	0.012
Phosphorated matter	0.637	0.489	0.450
Cholesterine	0.106	0.156	0.149
Soapy matter	0.893	0.851	0.919
1000 *parts of calcined blood.*			
Chloride of sodium	2.8	3.5	3
Soluble salts	2.6	2.5	2.7
Phosphates	0.404	0.493	0.348
Iron	0.513	0.471	0.468

As blood is abstracted, that fluid becomes impoverished and more watery, whence the density of defibrinated blood diminishes notably; the albumen also diminishes, but usually only slightly so, whence the diminution of the density of the serum is small; the fibrin is quite uninfluenced by venesection; the extractive matters and free salts are unaltered; the fatty matters are slightly lessened; the seroline, always variable, decidedly increased in some cases; the cholesterine seemed slightly increased; the chloride of sodium and other salts remained unchanged; the iron diminished slightly, being proportional to the globules.

THIRD LAW.—*Plethora and its accompanying symptoms probably result from an increase of the quantity of blood naturally contained in the system, but not from any alteration in the composition of that liquid, and particularly not from an increase of the proportion of its globules.*

MM. AMUSSAT and GAVARET attribute plethora to an increase in the proportion of globules naturally contained in the blood. The numbers on which they found this opinion cannot be questioned, but are wrongly interpreted. Undoubtedly, if the number they adopt 127-1000, as representing the quantity of fibrin naturally contained in the blood were correct, their conclusion would be legitimate; but we think we have shown that the above number is too low, and we thence conclude that the numbers which they give as expressing the proportion of globules in plethoric blood indicate healthy blood. From our experiments we conclude that in plethora the composition of the blood remains natural. Six men presenting all the characters of plethora were bled; they were, respectively, 24, 27, 28, 35, 38, and 48 years old. A plethoric woman, 21 years of age, was also bled. The following table exhibits the mean composition of the blood of those six men and one woman:—

	Mean of 6 men.	*1 woman.*
Density of blood defibrinated	1059	1059
Do. of serum	1028.3	1028.8
Water	780.4	784
Globules	138	131.5
Albumen	72.3	75.1
Fibrin	2.4	2.1
Extractive matter and free salts	6.3	5.8
Fatty matter	1.555	2.150
Seroline	Variable.	0.025
Phosphorated matter	0.433	0.673
Cholesterine	0.088	0.144
Soapy matter	1.014	1.038
1000 *parts of calcined blood.*		
Chloride of sodium	3.7	3.5
Soluble salts	2.9	2.8
Phosphates	0.341	0.334
Iron	0.547	0.544

The means in this table are exactly the same as those of healthy blood, excepting a slight increase of the proportion of albumen. The examination of each particular case confirms this result, which, however, seems unimportant, the increase is so slight. The proportion of fibrin was very irregular in the six cases; in one it was natural (2.2): in three it was much increased (3.2, 3.5, 3.5); in two, finally, it was very deficient (1 and 1.1); the two latter individuals were very robust, and presented but moderate symptoms of plethora.

FOURTH LAW.—*A diminution of the proportion of the globules of the blood characterizing anæmia, frequently occurs in diseases either as an essential character of disease, or as a complication or a consecutive phenomenon.*

The general condition termed anæmia occurs in—1, chlorosis; 2, after repeated bleedings or copious hemorrhages; 3, after a considerable evacuation of any of the fluids, as from copious diarrhœa or suppuration; 4, in poisoning by lead, and during protracted intermittent fevers; 5, during convalescence from debilitating diseases; 6, in ill-fed persons; 7, in individuals inhabiting damp unhealthy localities.

The following table gives the result of 35 analyses of the blood, showing its mean composition in as many cases of anæmia, developed from various causes, in all of which there existed a continued or intermittent bruit de soufflet in the carotids, which, according to the researches of MM. Andral and Gavaret, necessarily occurs whenever the proportion of the globules sustains a certain diminution. We shall hereafter consider whether the bruit de soufflet can exist without the proportion of globules being diminished:

	Mean.
Density of defibrinated blood	1047.4
Do. of serum	1017.1
Water	822
Globules	94.7
Albumen	68
Fibrin	3.5
Extractive matter and free salts	8
Fatty matter	1.806
Seroline	Variable.
Phosphorated matter	0.663
Cholesterine	0.110
Soapy matter	0.992

1000 grammes of calcined blood.

Chloride of sodium	3.5
Soluble salts	2.4
Phosphates	0.545
Iron	0.366

It thus appears—1st. That there is considerable diminution of the density of the blood when defibrinated, which is explained by the diminution of the globules; 2d, that the serum retains its density, the albumen not being diminished; 3d, that the globules are decidedly diminished; 4th, that the fibrin is slightly increased (3.5 instead of 2.2).

Fifth Law.—*The development of phlegmasia causes remarkable modifications in the composition of the blood, especially a considerable increase of fibrin.*

This law has been already established by MM. Andral and Gavaret, and is fully confirmed by the results of our researches, as set forth in the following table, which gives the means obtained from the analysis of blood in a considerable number of cases of well marked inflammation. The marked difference that exists between the two sexes renders it necessary to tabulate the results in two separate columns:

	Males.	Females.
Density of defibrinated blood	1056.3	1054.5
Do. of serum	1027	1026.8
Water	791.5	801
Globules	128	118.6
Albumen	66	65.8
Fibrin	5.8	5.7
Extractive matter and free salts	7	7
Fatty matter	1.742	1.669
Seroline	0.020	0.024
Phosphorated matter	0.602	0.024
Cholesterine	0.136	0.130
Soapy matter	0.984	0.014
1000 grammes of calcined blood.		
Chloride of sodium	3.1	3.0
Soluble salts	2.4	2.7
Phosphates	8.448	0.344
Iron	0.490	0.480

The fibrin and cholesterine are increased; the albumen is diminished in quantity. Recent researches tend to lead to the idea that fibrin and albumen are identical, or at least that fibrin is derived from albumen. May not, then, the increase in the quantity of fibrin observed in inflammations be explained by the transformation of a certain quantity of albumen into fibrin? This question can be elucidated by seeing whether the sum of the augmented fibrin and diminished albumen in inflammations equals the sum of the albumen and fibrin in healthy blood. In the healthy male the sum of those two principles gives 71.5; in the female 72. If we add these two principles in the blood drawn in inflammations, we get the numbers 71.6 in man, and 70.5 in woman: those numbers nearly correspond in man, but differ in woman.

Sixth Law.—*The proportion of fibrin in the blood may diminish, and its physical properties may perhaps be changed by a number of circumstances referable to two classes.* 1. *Poisoning, including typhus, yellow fever, and intermittent fevers, the plague, &c.* 2. *Insufficient nutrition; but this diminution does not necessarily occur.*

[The authors of the memoir say generally that they have found this proposition confirmed by their researches, the results of which are not given numerically.]

Seventh Law.—*When a secretion is suspended or diminished it often occurs that a certain number of the principles contained in the secretion in question are concentrated in the blood.*

[In support of this law, the authors of the memoir refer to the experiments of MM. Dumas and Prevost, who found that on tying the ureters of animals, and thus suppressing the secretion of urine, the blood on analysis yielded urea. They also refer to a fact which they have themselves ascertained—namely, that whenever the secretion of bile is suppressed, or even diminished, the quantity of cholesterine in the blood increases.]

EIGHTH LAW.—*The albumen of the serum of the blood diminishes considerably under these circumstances; Bright's disease—certain diseases of the heart, accompanied with dropsy, and grave puerperal fever.*

The developments of this proposition are reserved until the diseases here mentioned are considered. The number of facts examined are too few to warrant as yet the positive enunciation of this law, which, however, we believe to be true.

MM. Becquerel and Rodier next consider at great length the composition of the blood in various diseases, and compare their results with those obtained by other observers, especially by MM. Andral and Gavaret, and conclude by the following summary of their researches. The numerous and important results contained in this memoir are of three kinds; some are simply confirmations of the discoveries of our predecessors; others invalidate, in part at least, results hitherto generally admitted; others, again, are entirely new. Those three classes of results may be thus summed up:—

a. We have confirmed the following results.

1. Increase of fibrin in the phlegmasiæ, as established by MM. Andral and Gavaret.
2. Diminution of the globules in chlorosis, in anæmia, and under the influence of protracted abstinence—a fact ascertained by M. Lecanu, and confirmed by MM. Andral and Gavaret.
3. Diminution of the globules after hemorrhage, as first indicated by MM. Dumas and Prevost, and confirmed by MM. Andral and Gavaret.
4. The trifling influence of venesection on the fibrin.
5. The diminution of albumen in Bright's disease, pointed out by Gregory, Bostock, Christison, Andral and Gavaret.

b. Results which our experiments seem to invalidate.

1. The number 127-1000, stated to represent the general mean of the globules during health, is too low, and the mean is not the same in the two sexes.
2. The number 3-1000, supposed to represent the fibrin, is too high.
3. The supposed augmentation of the globules in plethora, affirmed by M. Lecanu, and admitted by MM. Andral and Gavaret. is erroneous.
4. The supposed, almost constant, diminution of the proportion of fibrin in bad fevers, is also a mistake.

11. *Composition of the Urine.*—In a highly interesting paper on the constitution of the urine, Liebig* maintains the following points:

A. That neither lactic acid nor any lactate exists in healthy urine; the evidence being, 1, that hitherto no example is known of lactic acid being produced by the decomposition of a nitrogenous substance; 2, that the urine of the herbivora, in which lactic acid or its salts might be expected, (if they existed in that of the carnivora,) does not contain either; 3, that lactic acid has never yet been clearly detected in the urine of men or carnivora; 4, that the carnivora take no food from which lactic acid could, by transformation, be produced; 5, that fresh urine will not dissolve the smallest quantity of barytes, though lactate of barytes is easily soluble in water; 6, that in various and the most careful experiments, it has been impossible to detect even a trace of lactic acid in large quantities of putrid urine, in which, if it had existed when fresh, it could not have been altered by putrefaction, and if it had not existed when fresh, it might, perhaps, have been produced by putrefaction. An organic acid was produced in putrefaction, but it was acetic acid combined with a resinous highly azotised substance.

B. Hippuric acid is a constant constituent of healthy human urine; for 1, benzoic acid is obtained (as Proust observed), with acetic acid, by distilling urine with sulphuric or hydrochloric acid; but, 2, this benzoic acid cannot exist as such in the fresh urine; for benzoic acid is converted in the organism into hippuric acid; and the hippuric acid known to exist in the urine of herbivora yields benzoic acid when it is decomposed; and 3, the existence of hippuric acid may be clearly

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* Ann. der Chemie und Pharm., Mai; and Lancet, June 1-8, 1844.